IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
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James Robert Adair, Jr. et al.	)	
	)	Examiner: **Thanh K. Truong**
Serial No. **09/954,443**	)	
	)	
Filing Date: **September 17, 2001**	)	Art Unit: 3721
	)	
For: **Heat Seal Die and System and Method For Portion Control Sized Packaging**	)	

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Edward Joseph Cigallio, hereby declare that:

1. I am a co-inventor of the above-identified patent application (the "Patent Application"). I am currently employed by Printpack, Inc., a leading provider of printed flexible technology and products, as a Packaging Systems Manager developing printed flexible packaging and manufacturing systems. I have 10 years experience working in the field of printed flexible packaging, and previously worked as a manufacturing engineer improving process and mechanical efficiencies. I have a degree in mechanical engineering from the University of Kentucky.

2. My work in connection with this invention began as an effort to solve the problem of serum leakers in portion control packages formed by heat sealing in a form/fill/seal machine. Portion control sized packages are relatively small portions of material in flexible, single serve packages designed to control the portion of the material consumed by the end user. Condiments

such as ketchup and mustard served in flexible, single serve packages in fast food restaurants are examples of common portion control size packaged liquid-containing materials. Serum leakers are portion control packages that leak liquid through the heat seal of the packages.

3. It is my understanding that Claims 9-26 of this application, including independent claims 9 and 18, are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,301,859 issued to Nakamura et al. (the Nakamura Patent) in view of U.S. Patent 4,896,048 issued to Boeckmann (the Boeckmann Patent).

4. I am very familiar with the printed flexible packaging systems and products. I am familiar with the is patent application and have reviewed the substantive Office Actions in this application and the prior art cited by the Examiner in the substantive Office Actions, including the Nakamura Patent and the Boeckmann Patent.

5. The system of claim 9 of this application describes a heat sealable material feeder, a flowable material feeder for feeding a flowable liquid-containing material, and a form/fill/seal apparatus structured and arranged for making portion control sized packages. Specifically, this form/fill/seal apparatus is structured and arranged for receiving the heat sealable material, forming a portion control sized package with the heat sealable material, filling the portion control sized package with the flowable liquid-containing material, and sealing the portion control sized package. The form/fill/seal apparatus includes a heat seal die comprising first and second heating elements and first and second longitudinal heat tubes disposed, respectively, in first and second die members. The heat tubes, which can also be described as heat pipes, are disposed between the heating element and the die face of each die member for maintaining a

substantially uniform heat seal temperature along the length of the die faces. The substantial uniformity of heat seal die temperature significantly decreases the occurrence of serum leakers, which are packages that leak liquid through the package seal.

6. Heat tubes (heat pipes) typically comprise a closed metal tube, a wick disposed in the tube, and liquid disposed in a portion of the remaining volume of the tube. As the temperature along the heat tube changes, the fluid in the hotter area of the tube boils, picking up latent heat of vaporization. This high pressure travels to the lower pressure (cooler) area of the tube and condenses, thus transferring heat to the cooler area. This cycle in the heat tube equilibrates the temperature across the heat seal die members and keeps the temperature substantially uniform.

7. Form/fill/seal machines for making portion control sized packages simultaneously seal the bottoms, and then the tops of several packages, as many as 12 or more packages at once. In this circumstance, uniform temperature, pressure, and dwell time across the flexible packaging material are critical. When sealing flexible packaging material to make portion control sized packaging, the two opposing faces of the flexible material must be heated to at least a temperature at which the material softens, but not so high as to liquefy. The softened surfaces must be pressed together and maintained in intimate contact for a time sufficient to allow the entanglement of polymeric molecules across the interface separating the surfaces. As the sealed area cools, the entangled polymers effectively weld the two surfaces together, eliminating the previously separate surfaces and becoming a monolithic layer of material with thickness approximately equal to the sum of respective thickness of each of the two materials. This

combination of pressure, temperature, and time of pressure application (dwell time) constitute the three basic variables used to control heat sealing processes.

8. In portion control packaging, narrow channel leaks can be formed when heat sealing flexible materials together to form the packages, particularly when the temperature along the length of the heat seal die is non-uniform such that the temperature in some areas falls below that required for adequate heat sealing. These narrow channel leaks can escape detection until after the portion control packages are packed and distributed in bags or cases. Channel leaks in portion control packages leak serum from the flowable material inside the packages and can contaminate the entire contents of bags or cases of portion control sized packages.

9. The Nakamura Patent teaches conventional form/fill/seal packaging and does not relate to what is known in the industry as portion control size packaging. The Nakamura Patent teaches using heat sealing jaws comprising heat conducting members 33a and 33b such as solid rods of copper having a high conductivity, instead of heat tubes or heat pipes as described in amended independent claims 9 and 18 of this application. Col. 8, l. 39-42. The heat seal jaws disclosed in the Nakamura Patent are not for portion control sized packaging as they are larger and include an integral cutter blade 30 and cutter groove 22 for simultaneously cutting flexible packaging upon heat sealing. The Nakamura Patent describes a concern with heat transfer through the depth of the heat seal dies from the heating element to the die face. The solution in the Nakamura Patent is to place the high conductivity solid copper rods between the heating elements and the die face of the heat sealing jaws.

10. The Nakamura Patent expressly teaches that heat tubes (heat pipes) should not be used in the heat sealing dies, taking the position that heat tubes do not distribute heat adequately in the radial direction. Col. 9, l. 44 - col.10, l.27. Figs. 11A and 11B of the Nakamura Patent illustrate a prior art heat seal die comprising heat tubes, but the specification of the Nakamura Patent teaches that heat tubes should not be used.

11. The Boeckmann Patent does not relate to the use of heat tubes (heat pipes) or heat conducting members in heat sealing jaws, but rather, addresses the problem of package leaks formed by stretching the plastic film when heat sealing to reduce wrinkling. According to the Boeckmann Patent, reducing wrinkling of the film reduces leaks in the packaging.

12. There is no motivation to combine the Nakamura Patent and Boeckmann Patent, because the Nakamura Patent actually teaches away from using heat tubes, does not suggest using heat tubes in portion control sized packaging systems, and certainly does not appreciate the problems particular to the smaller, thinner portion control sized packaging heat seal dies. With portion control sized packaging heat seal dies, there is little concern about heat transfer through the depth of the dies, as they are small and thin. Instead, the concern is uniformity of temperature along the long length of the dies. This problem is well addressed by Applicants' invention as defined in independent claims 9 and 18 of this application, while the Nakamura Patent does not address portion control sized packaging systems or this problem, and even teaches away from using heat tubes.

13. There would have been no reasonable expectation of success to one of ordinary skill in the art at the time the invention was made in view of the Nakamura Patent which clearly

teaches not using heat tubes in heat seal dies. The Nakamura Patent describes heat tubes as inadequate in heat sealing. Applicants' have shown that heat tubes are very effective in heat seal dies for portion control form/fill/seal packaging systems.

14. The combination of the Nakamura Patent and Boeckmann Patent does not result in the invention described in independent claims 9 and 18. The Boeckmann Patent solves heat seal packaging leaks by stretching the plastic film during heat sealing to reduce wrinkling. The Boeckmann Patent makes no reference to portion control sized packaging or equipment for making portion control sized packaging and does not suggest using heat tubes to solve the problem addressed by Applicant's invention. Accordingly, the Boeckmann Patent does not add the shortcomings of the Nakamura Patent.

15. The Nakamura Patent, at col. 1, lines 13-55, describes "weighing and packaging... each article M...[where e]ach article M may be one or a quantity of edible or non-edible items, for example, potato chips, fruits, candies, vegetables, screws, nails, bolts or other things desired or required to be bagged." As such, the packaging system description includes a lengthy list of machinery components to deliver and weigh the kind of *discreet* articles provided as examples: dispensing feeder of...inverted conical shape; vibratory hoppers; pool hopper; weighing cells; control device...to select a combination of some or all of the weighing hoppers; and gates of some or all of the weighing hoppers.

16. The portion control packaging machinery system encompassed by Applicants' claims differs from that in Nakamura in significant ways. In particular, the system and method of Applicants' claims 9 and 18 packages product comprising not several *discreet items* (the sum

of whose weight equals a specified amount), but rather a *liquid-containing material,* of higher or lower viscosity as the case may be. The amount of product packaged depends on volume, not weight. As a result, the process used to deliver product to each package use on volumetric displacement, not weighing cells. The packaging machinery in Figure 10 of the Nakamura Patent produces one bag filled with article "M" with each cycle described in the text cited. The technology of claims 9 and 18 encompasses a preferred embodiment wherein multi-lane portion control packaging machinery system makes many (equal to the number of lanes) pouches with each cycle of product delivery. This multi-lane, multi-pouch production cycle efficiently produces portion control liquid containing products such as condiments. The subject matter of claims 9 and 18 provides consistent seal integrity across multiple lanes of this machinery. In contrast, the Nakamura Patent teaches that heat tubes do not adequately maintain an acceptable longitudinal temperature variation (i.e. in the direction "X" as indicated in Figure 1A) for heat-seal jaws (Column 9; lines 44-67). In fact, multi-lane portion control packaging machinery has heat-seal jaws with much less depth (Dimension "Y" in Figure 1b) than the packaging machinery described in the Nakamura Patent.

17. Embodiments of the invention encompassed by independent claims 9 and 18 demonstrate unexpectedly superior results over prior art devices. Generally, during heat sealing of portion control packaging, the temperature variation across heat seal dies made in accordance with embodiments encompassed by independent claim 9 of this invention are substantially less than the temperature variation across heat seal dies made in accordance with the prior art (without heat tubes).

18. Figures 1 and 2, below, are graphic representations of temperature distribution across the top and bottom sealing bars on a type of portion control sized packaging machine called a multi-lane four-side seal pouch machine. Figure 1 illustrates a prior art form/fill/seal machine and Figure 2 illustrates an embodiment of the present invention, as described by claims 9 and 18 of this application. During actual commercial production, the prior art machine showed a temperature difference of 23 degrees F across the front sealing bar of the heat seal die and a 31 degree F difference across the back sealing bar of the heat seal die. Such variation across the width of these seal bars can result in insufficient heating and sealing of the pouches. As can be seen in Figure 2, with an embodiment of the present invention, these differences dropped to 8 and 4 degrees F, respectively.

19. The heat seal die of the prior art machine was made of steel and did not include heat tubes. The heat seal die of the invention embodiment was made of hardened 440 stainless1 steel and included heat tubes. The invention embodiment and the prior art machine were identical in construction and operation except for the structure of the heat seal dies. Both machines were operating to heat seal laminated film in the formation of portion control packaged condiments.

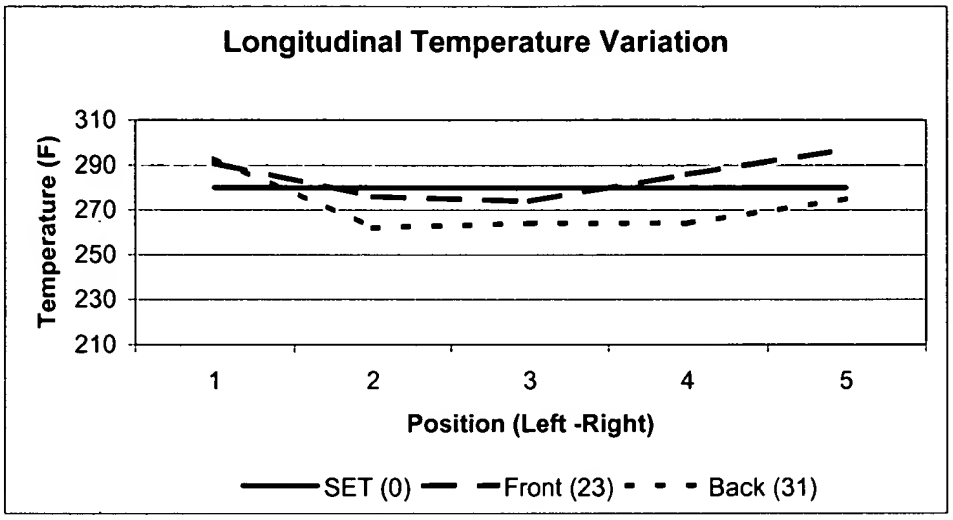

Figure 1: Operating Profile Without Invention

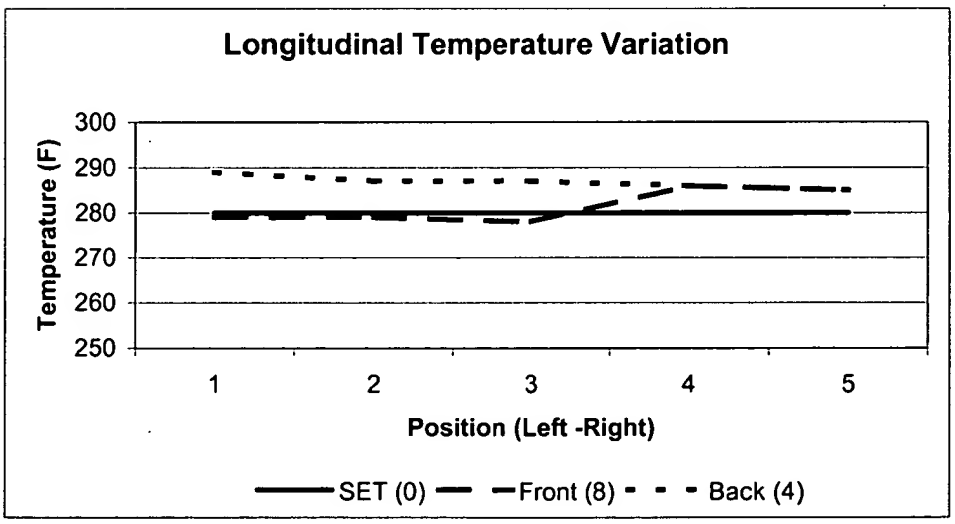

Figure 2: Operating Profile With Invention

20. These results are particularly unexpected in view of the disclosure in the Nakamura Patent, which teaches that heat tubes are inadequate for controlling temperature in heat seal dies.

21. Other commercial application of embodiments of this invention have also been unexpectedly successful. Golden States Foods (GSF) is a licensee under this patent application and uses form/fill/seal machines for manufacturing portion control packaged condiments such as ketchup. GSF is the largest supplier of liquid products to McDonald's restaurants.

22. In January 2002, the owner of this patent application, Printpack, in conjunction with GSF, installed embodiments of the invention encompassed by claims 9 and 18 of this application in a GSF liquid products plant in Conyers, Georgia. The embodiments implemented by Printpack and GSF were multi-lane, four side form/fill/seal machines for making portion control packaged condiments equipment with hardened stainless steel cross heat seal dies including longitudinal heat tubes (hereinafter the Embodiments). Prior to implementation of these Embodiments, GSF operated this form/fill/seal machines with cross heat seal dies made of steel and lacking heat tubes. (the Prior Art Machines).

23. The Prior Art Machines operated by GSF exhibited temperature variations exceeding 60°F across the cross heat seal dies, while specifications for the packaging film used normally set a 20°F variation. Such a discrepancy between film specifications for heat seal die temperature variation and actual cross heat seal die temperature variation in the Prior Art Machines reduced the seal integrity of the portion control packaging and increased the number of serum leakers.

24. The Embodiments installed and implemented at GSF in January 2002 reduced the temperature variation across the cross heat seal dies to less than 10°F and thereby significantly enhanced the cross seal integrity of the portion control packaging produced. As a result, the

number of cases of portion control packaged condiments withheld from distribution by GSF due to serum leakers dropped by 79% and labor necessary to rework such withheld cases dropped by about $75,000 annually. The reduction in serum leakers also enhanced the quality of product delivered to GSF's customers.

25. Reducing serum leakers in portion controlled packaging has been a long felt, but unsatisfied need in the packaging industry. A publication titled "Portion Control and Flexible Packaging: A Reference Manual for the Dressings & Sauces Industry First Edition;" (The Association of Dressings & Sauces; August 1999; Atlanta, Ga; 150 pages) (hereinafter the "Manual") provides guidelines for portion control packaging of liquid containing materials such as condiments and sauces. This Association of Dressings & Sauces serves the market at which the invention described in the present application is directed. The Manual generally indicates that serum leakers are considered a serious problem in the portion control packaging industry. See *Manual,* pages 132-137. The Manual advises as follows:

"Packaging films have changed dramatically over the last 20 years, yet serum leakers were there then and they are still here now. Studies have been done varying sealant materials and sealant thickness along with packaging machine conditions."

See *Manual*, page 134.

26. The Manual speculates that "gathering of the film and subsequent wrinkles may be the cause of most serum leakers." See *Manual* page 132. The *Boeckmann* patent cited in the Office Action also focuses on wrinkles as the source of the problem. The Manual suggests that

portion control packaging machines must be maintained very diligently to minimize serum leakers. See *Manual,* page 134.

27. In "Table 8-4-Leaker analysis for Problem Solving", the Manual describes seven (7) types of defects from leaking, three (3) of which involve seal area faults.

Observed Defect	**Possible Cause**	**Pattern**	**Action**
Unsealed Seam Areas [5 of 7] 1)	Inadequate amount of sealant	No bonding in seal area. Gaps or spaces in seam	Confirm thickness of sealant layer against specification
2)	Defective composition of sealant layer	Reduced bond strength in seal area. Seam degenerates over storage	Packaging material defect
3)	Sealing temperature too low on sealing bars	No bonding in seal area. Leakers occur in same lane of equipment	Test and verify temperatures of heat seal bars. Replace units as needed
4)	Inadequate pressure on sealing bars, or poor mating of sealing bars	Reduced bond strength in seal area. Leakers will occur in repeat locations	Verify pressure with pressure sensitive paper. Replace springs as needed
5)	Inadequate dwell time on sealing bars	Reduced bond strength in seal area. Leakers occur in repeat locations	Reduce operating speeds. Timing adjustment
Cracks in seal area. [6 of 7]	Excessive pressure on sealing bars	1) Small breaks across seal area, or localized 2). Melted appearance or fracturing at seams	1) Adjust equipment. 2) Reduce and verify sealing bar temperatures
Serum Leakers after	Excessive heat or	Serum leakage from	Reduce storage

30 days [7 of 7]	pressure on the package in storage may contribute to serum leaker occurrence from any cause	package during storage. Very small seam interruption	effect if possible. Increase grade of corrugated material if needed.

Manual, Pp. 80-82

28. The *Manual* is a current summary of industry beliefs and practices presents conflicting views on the causes of and remedies for leakers in multi-lane portion control packages. High temperatures and pressures are implicated in some cases (Table 8-4, 5.3, 5.5, and 6.2), while Appendix A No. 4 blames low temperatures and pressures. The one potentially consistent remedy, "reduce operating speed" (Table 8-4, 6.2) is not an economical option. While mention is made about "adjusting" and maintaining the performance of the packaging machinery components, no consideration is given to the ability of the machinery to maintain the tolerances necessary to prevent leakers and there is no recognition that uniformity of temperature across the heat seal die causes leakers.

29. Furthermore, according to cited U.S. Patent 3,677,329 issued to *Kirkpatrick*, heat tubes have been available for over thirty years, but to my knowledge, they have not been implemented in portion control sized packaging heat seal dies until Applicants' invention. This could be due to the prior understanding in the art that heat tubes will be unsuitable, as taught by the *Nakamura* Patent.

30. I declare that all statements made herein of my own knowledge and belief are true and that all statements made on information and belief are believed to be true, and further that

the statements are made with the knowledge that willful false statements are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 9/29, 2003

Edward Joseph Cigallio